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THE CANADIAN GEOLOGICAL SURVEY,

AND ITS DIRECTOR,

SIR WILLIAM EDMUND LOGAN, Kt. F.R.S.

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Previous to the two great Industrial Exhibitions at London, in 1851, and Paris in 1854, the world at large may be said to have been in total ignorance of Canada's resources. Many people indeed appear to have been scarcely cognizant of her geographical position on the surface of the globe. Even our enterprising neighbors of the United States were but partially aware of what the country was capable of producing; and each member of our own population was too much engaged with his own pursuits to have any defined idea of the character or productiveness of those districts remote from his own immediate neighborhood.

Within these five years, however, through the medium of the above mentioned sources, it has been shewn that, while in various branches of mechanism and manufactures, the mechanics and manufacturers of Canada are in some respects in advance, and in the generality of cases equal to those of other nations—and while Canadian agricultural products are admitted to be of the highest quality—Canada can produce an amount and variety of raw material, equal, in proportion to the extent of area, to any other country in the world.

For the superb collections of minerals, which appear to have been the theme of universal admiration on both occasions, the country is mainly indebted to the Geological Survey of the Province, and the unwearied exertions of its Director, on whom Her Majesty has recently conferred the merited honor of knighthood. The fruits of his labors are only now beginning to be developed, and his untiring zeal, energy and disinterestedness, cannot be over-estimated; and with

these convictions it is incumbent on the people of this Province to show that they fully appreciate the great benefits rendered to their country, by a unanimous expression of their approbation of Sir W. E. Logan's services as Director of the Geological Survey, and as one of their principal representatives in London and Paris.

It is scarcely possible, in a brief communication like the present, to convey an accurate idea of the labor and diligence with which Sir W. E. Logan has conducted the Geological Survey of Canada; but to impress the fact upon those who are little aware of the magnitude of his undertaking, it may be well to record as concisely as possible the results of the investigations carried on under his direction, and in doing so I may be permitted to add a few remarks on the position accorded to him by men of science in both Europe and America.

Previous to his engagement with the Canadian Government, the reputation of Mr. Logan (as we shall still call Sir William in referring to his past career) stood deservedly high, although his merits were then only known and appreciated by the comparatively few scientific men with whom he had direct communication. At an early period he made a very valuable collection of the birds and insects common to Canada, included in which were many species previously unknown, which he subsequently presented to the Institution at Swansea, of which he was one of the founders, and a zealous promoter of its interests during his residence in that locality.

But it was in the field of geology that Mr. Logan was destined to bear a conspicuous part, and it was during his residence in South Wales, that he performed a work which has been declared by the first scientific men in Europe to be "unrivalled in its time, and never surpassed since." This great work was his Geological Map and Sections of the Glamorganshire Coal-field, the minuteness and accuracy of which were such that when the Government Survey, under Sir Henry de la Beche, came to South Wales, not one single line drawn by Mr. Logan was found to be incorrect, and the whole was approved and published without alteration. Nor was this all:—the system Mr. Logan had pursued in following out the details of the coal-field was so vastly superior to any hitherto adopted, that the principle has been fully adopted by the British Survey. Mr. Logan's map may be said to be the model one of the whole collection. It ought to be borne in mind also, that at this time he was not employed as one of the geological staff, but simply as an amateur, and that ---in the same spirit as so many of his Canadian observations have been carried out,---he generously presented the fruits of his labors, without fee or remuneration, to the British Government.

While engaged in the examination of the coal-formation, Mr. Logan contributed many interesting and valuable papers to the Geological Society of London, among which may be specially noticed one on the "Stigmara beds" or "under clays" which accompany every coal-seam; as from the observations recorded then, the long disputed theory as to the origin of coal was finally set at rest, and the inferences it led to universally acknowledged. Another paper, contributed prior to his connexion with Canadian Geology, also deserves notice here, as it refers to a matter in which a portion of Canada is deeply interested. It is entitled: "On the effect of the *packing of the Ice* in the River St. Lawrence opposite the City of Montreal." The principles laid down in this latter paper appeared so indisputable to Mr. Stephenson, the eminent engineer, that he has been materially guided by it in reference to the construction and site of the great Victoria Bridge.

In 1842 the Canadian Legislature came to the determination of having the Province geologically explored, and it was in the same year that Mr. Logan—having been recommended most strongly by the leading geologists of Great Britain, from each of whom he received the most flattering testimonials—was applied to by Lord Stanley, then Secretary for the Colonies, to undertake the investigation. In the same year he proceeded to Canada, completed a preliminary examination, made arrangements with the Colonial Government and returned to Britain,—the whole expense of which visit he paid out of his own pocket,—and early in the following year (1843) he finally returned to Canada, accompanied by an assistant, to commence the investigation in earnest.

It was in 1842, also, that Mr. Logan examined and accomplished the measurement of the remarkable section of the coal measures at the South Joggins, in Nova Scotia: a work acknowledged to be one of the most important in American geology, as the key to the structure of the whole eastern coal basin;—and which was published as an appendix to his Report of Progress in 1843.

The first grant of money made by the Canadian Legislature to carry out the proposed survey for two years, was only £1500 currency, so that it will be obvious it was only by the strictest economy that the salaries could be paid, and travelling and other expenses met; indeed, notwithstanding all the care possible, the necessary work could not be effected with this small grant, and accordingly at the expiration of that time Mr. Logan found himself out of pocket upwards of £800.

During the summer and autumn of 1843 Mr. Logan was employed in an examination of the coast of the Gaspé Peninsula, while

he sent his assistant to make a section of the Upper Province, through the country lying between the Lakes Huron and Erie—one grand object of the expedition being to determine what the probabilities were of the existence of coal measures at either end of the Province. In 1844 both Geologists were occupied in exploring and completing a topographical survey of the Gaspé Peninsula, and in 1845, while the Director made a survey of the Ottawa River up to Lake Temiscamang, and of its tributary the Mattawau to Lake Nipissing—his assistant continued the examination and topography in Gaspé. In 1845 the Legislature made a farther appropriation to the Survey of £2,000 currency per annum for five years, and the same was renewed in 1850 for five years more. In 1846 the Copper region of Lake Superior occupied the entire attention of the Survey; and since that time an immense amount of country has been examined in various parts of the Province, the greater portion of which being entirely wild and unknown, it was found necessary to survey topographically. Besides the geology,—much of it of the very highest economic importance,—which has been followed out on both sides of the St. Lawrence, both above and below Montreal, in the Eastern Townships, and in the region around the confluence of the Ottawa; the courses of all the main rivers of Lake Huron on the one side of the "Height of Land," and of the Ottawa on the other, have been traced and measured to their sources, the Lakes and principal features of the interior surveyed, and the elevation of every fall and rapid ascertained trigonometrically or by spirit level. Those surveys have since been mapped on a scale of an inch to a mile, with every particular noted thereon.

Moreover, a regular system of measurements has not been confined to the totally wild and unfrequented parts, but has been found absolutely necessary throughout nearly the whole of the settlements in consequence of the numerous inaccuracies and omissions in the various township plans. Where a more accurate method could not be obtained, all the observations were connected by a registration of each step taken by the observer, the bearings from one point to another being taken by compass. And as an example of the amount of work accomplished by this means—Mr. Richardson (who has been employed as an explorer since 1845) in 1853 registered paces in his note book making a total distance during the season of upwards of 1000 miles. The results of this process have also been mapped on a scale of an inch to a mile, and have supplied, on many occasions, much material to fill up deficiencies, and correct discrepancies, on the old published maps.

The result of these investigations is already acknowledged to have

been of incalculable benefit to science, as having most essentially thrown light, where there was much misapprehension before, on the whole of American Geology; and they have, moreover, beyond dispute, been productive of the most valuable information as regards the distribution of economic materials. While the position of such useful materials as *do* exist can be readily recognised by reference to the Geological map, in which the various formations are represented by different colors—those that *do not* exist, will be found wanting and, consequently, need not be looked for; such, for example, is the case with regard to coal—a mineral not likely to be found among rocks recognised as belonging to the Silurian and Devonian epochs.

Having thus glanced over the Field operations of the Survey, let us shortly consider the means the Director has had at his disposal to accomplish what already has been done.

In 1843, Mr. Logan, accompanied by a single Indian with a Bark canoe, made a thorough examination of the whole of the Gaspé Coast, counting every step he took from Cape Rosier to Fort Daniel, besides making many pedestrian excursions into the interior—and collecting a large quantity of most valuable fossils and other specimens. And while he was thus employed his assistant, Mr. Alexander Murray—frequently entirely alone, and often in parts remote from all settlements—collected sufficient information to give a tolerably correct idea of the structure of the whole Western Peninsula. In 1844 and 1845, a triangulation was effected across the Gaspé Peninsula from Cape Chatte to Bay Chaleur, a large portion of the range of the Notre Dame or Shick-Shock Mountains surveyed, most of the principal Rivers measured, the Geological character of the rocks ascertained, and specimens collected. This service was performed with a party consisting of only four Indians with two canoes. In making the survey of the Ottawa more assistance was found to be absolutely necessary, but except in few instances, neither Mr. Logan nor Mr. Murray's party have exceeded the complement of *six* altogether—inclusive of four Indians and an assistant.

Since 1845, when the additional appropriation was granted, an explorer has been added to the staff whose labors have been incessant and of great value; but while fully admitting the greatly improved circumstances under which the survey was then placed, and the more extensive scale under which the operations were enabled to be carried on, it must be clear to any one at all acquainted with the nature of the service, and of the difficulties to be encountered in a perfectly

new country, that the amount of work performed and reported upon never could have been accomplished but by the most indefatigable perseverance and continued application. Accuracy with Mr. Logan is everything—nothing is allowed with him to be of the slightest value that is not essentially correct. With regard to the office work, we have simply to refer to Mr. Logan's own answer before the Select Committee of the House of Assembly to question 73, on page 26 of the published report, to show how his time is there employed :

Question 73 page 26 (referred to.)—"Each one on the Survey has so much to do connected with his own individual department, that all the general office work falls upon me. I keep all the accounts, and for that purpose a set of books by double entry, in which I enter no gross sums, with a reference to accounts, but everything in detail for easy and immediate reference if required, and I render an account to the Government with the same detail on the face of it; so that any one, whose chooses, either publicly or privately, to look at the account, can see at once how every penny has been spent. I used at first to make, with my own hands, four manuscript copies of the annual Report of Progress, often reaching more than one hundred printed pages—one copy for the Government, one for the House of Assembly, one for the Legislative Council, and one for the Printer; but of late I have been forced to employ an amanuensis for part. The fittings of the Museum are scarcely yet completed; when they are I *must* employ additional aid, if it should cost me my whole salary. The accumulated material of eleven years are to be classified and arranged."

Emulating the example of their Chief, the assistants have also laboured with diligence and credit to themselves, and have undergone similar fatigue and hardship. In the Chemical Department Mr. Hunt has, since his connexion with the Survey, established a high reputation among the foremost ranks of the men of Science both in Europe and America; whilst the others have acquired a fair proportion of merit by their contributions to the Geology and Geography of the Province.

It has frequently been urged by some that the proceedings of the Survey were too *Scientific* and not *sufficiently practical*—that great attention has been paid to *Fossils*, and to remote and comparatively Northern districts of country—while a partial attention only has been given to certain known Mineral districts, and the more densely settled and more available lands. In answer to this let us take the concluding portion of Mr. Logan's reply to Question 93, page 39, of the Reports of the Select Committee.

Question 93, page 39.—"Thus, Economics lead to Science, and Science to Economics. The physical structure of the area examined is, of course, especially attended to, as it is by means of it that the range or distribution of useful materials, both

discovered and to be discovered, can be made intelligible. A strict attention to Fossils is essential in ascertaining the physical structure. I have been told that some persons, observing how carefully attentive I endeavour to be to this evidence of sequence, have ignorantly supposed the means to be the end, and while erroneously giving me credit as an authority upon Fossils, have fancied Economics to be sacrificed to them. In their Fossil darkness, they have mistaken my rush-light for a Sun. I am not a Naturalist. I do not describe Fossils, but use them. They are Geological friends who direct me in the way to what is valuable. If you wish information from a friend, it is not necessary that you go to him impressed with the idea that he is a collection of bones peculiarly arranged, of muscles, arteries, nerves and skin, but you merely recognise his face, remember his name, and interrogate him to the necessary end. So it is with Fossils. To get the necessary information from them you must be able to recognise their aspect, and in order to state your authority you must give their names. Some tell of Coal; they are Cosmopolites; while some give Local intelligence of Gypsum, or Salt, or Building Stone, and so on. One of them whose family name is *Cythere*, but who is not yet specifically baptized, helped us last year to trace out upwards of fifty miles of Hydraulic Limestone."

In concluding these observations on the character of Mr. Logan's labours in conducting the Geological Survey, carried on as it has been with unusual earnestness and zeal, I cannot do better than refer to a quotation from the *London Quarterly Review*, October, 1854, which occurs in the Report of the Committee above named—and in doing so, express a hope that in this instance the old adage will not hold good, that "a Prophet has no honour in his own country." for in fact and in spirit, Canada is Mr. Logan's country. He was at one time applied to by the East India Company to undertake an examination of their territory for Coal; a work for which, by his past investigations, he was peculiarly fitted. The field of research was new, and India was then attracting much more attention than Canada. The emoluments would have greatly exceeded those of his present office; his staff was to be ample, and of his own selection; unlimited aid was to be afforded by the Indian Government; and although he felt quite convinced that the investigation would lead to a very extended reputation, yet being influenced by a rooted attachment to this country, and feeling that he was in some degree pledged to it because he is a native Canadian, the munificent offer of the East India Company was not accepted. The quotation above referred to read as follows:—"In Canada, there has been proceeding for some years one of the most extensive and important Geological Surveys now going on in the world. The enthusiasm and disinterestedness of a thoroughly qualified and judicious observer, Mr. Logan, whose name will ever stand high in the roll of votaries of his favourite Science, have conferred upon this great work a wide-spread fame."

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As I have already said, the services of Sir W. E. Logan in London and Paris alone entitle him to the unanimous acknowledgments of his country; may we hope that the Legislature will give substantial expression of its approbation, as well as of its appreciation, of the justly merited distinction which Her Majesty has conferred on the representative of Canadian Science, and there is no manner, I feel assured, in which this could be done more acceptably to Sir W. E. Logan himself, and more creditably and lastingly beneficial to the Province, than in extending to the Survey increased support, and in placing at his disposal ample means to enable him to carry on this most important service to a successful termination.

